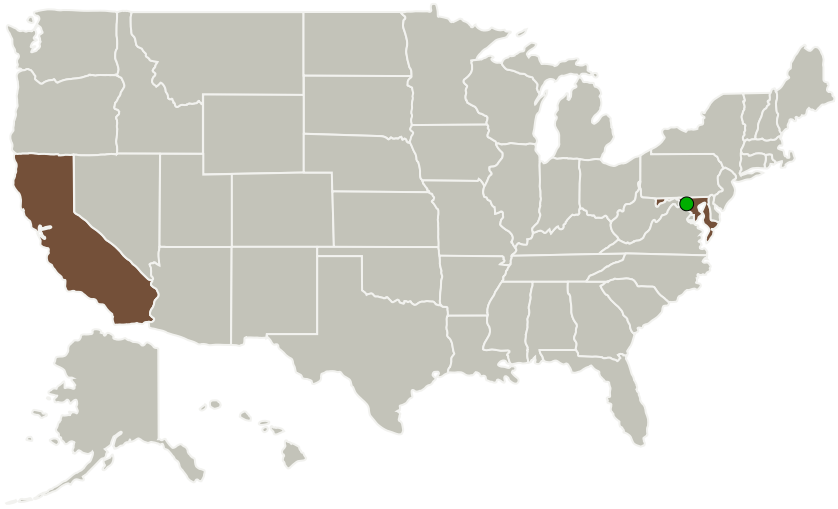
Innovative Fiber-Optic Gyroscopes (FOGs) for High Accuracy Space Applications, Phase I

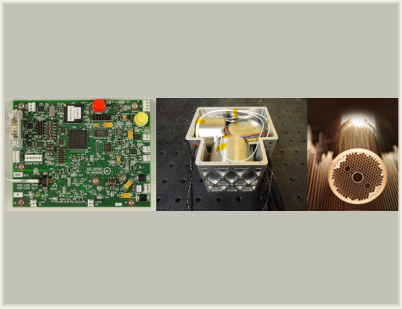
Completed Technology Project (2015 - 2015)

Project Introduction

NASA's future science and exploratory missions will require much lighter, smaller, and longer life rate sensors that can provide high accuracy navigational performance that will not be compromised in stressing radiation and vibration environments. IFOS proposes to develop a compact, highly innovative Inertial Reference Measurement Unit (IRU) that pushes the state of the art in high accuracy performance from a FOG with drastically reduced optical and electronic package volumes. The proposed IRU is envisioned as a critical part of an Inertial Measurement System (IMU) to be prototyped in future phases of the project. The basic design features a novel, small volume, high performance FOG configuration, capable of providing high-end tactical grade and navigational grade performance from much smaller size units as compared with IMUs currently available. The proposed gyroscope is based on an innovative approach using a Photonic Crystal Fiber (PCF) coils that can be extended to shorter wavelength (SW) operation for even more drastic size and weight reductions while maintaining accuracy and low noise attributes at kHz bandwidths. While the optic unit is inherently radiation resistant, the project also aims to apply cutting-edge electronics packaging approaches that are compatible with radiation hard (RH) components. Phase I will focus on feasibility study of the PCF FOG concept, demonstration of critical components, performance/size tradeoffs and preliminary designs of FOG-based packages, leading to a prototype IRU to be designed and built in Phase II, where advanced designs for an IMU will also be developed.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Intelligent Fiber Optic Systems Corporation	Lead Organization	Industry	Santa Clara, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

June 2015: Project Start

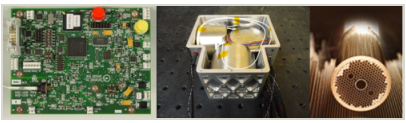
December 2015: Closed out

Closeout Summary: Innovative Fiber-Optic Gyroscopes (FOGs) for High Accuracy Space Applications, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138993)*

Images



Briefing Chart Image
Innovative Fiber-Optic Gyroscopes (FOGs) for High Accuracy Space Applications, Phase I
(https://techport.nasa.gov/image/128748)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Intelligent Fiber Optic Systems Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Behzad Moslehi

Co-Investigator:
Behzad Moslehi

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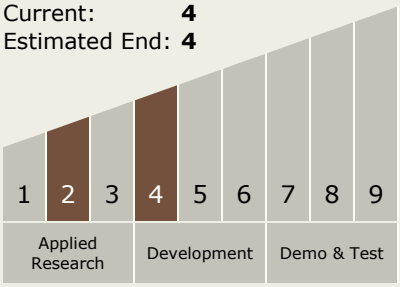
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System